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its temple and its god Corambé, constitutes the most interesting bit of child-literature with which the writer is acquainted.

Those who are interested in that view of infant development which makes it a recapitulation of the growth of the species (the ontogenetic-phylogenetic parallel) will find many illustrations of the principle scattered throughout the volume. On the whole, it may be said that Professor Sully has given us the most readable, and one of the most valuable works on the psychology of childhood that have appeared in any language, — a distinct addition to the literature of this subject which will do much to gain for that line of study the appreciation which it deserves.

FREDERICK TRACY.

The Primary Factors of Organic Evolution. By E. D. COPE. Chicago, Open Court Publishing Co., 1896. — pp. xvi, 547.

In this volume the distinguished leader of American Neo-Lamarckians gathers together the evidence tending to establish the reality and importance of direct adaptation to environment as a factor in Organic Evolution. Out of the rich stores of his palaeontological knowledge Professor Cope is able to make out a very strong case for the view that the Lamarckian factors, *i.e.*, mechanical strains, physical and chemical conditions, the use and disuse of the various parts of the organism, etc., have been the directing forces in the gradual development whereby the existing forms of life have come into being. At least he easily shows that the actual succession of organisms is just what might have been expected *if* such had been the efficient and directing causes of Variation. This method of argumentation does not, of course, *compel* assent. For it avails not to show in a thousand cases that the facts look *as if* the Lamarckian factors had been active: that is no proof that they were the actual causes, and it may still remain only a curious coincidence that the 'spontaneous' variations should have appeared just where Lamarckism led us to look for them. All that can be done in this way is to render the Lamarckian explanation increasingly probable, and this, it must be admitted, Professor Cope has done with admirable skill. He also makes effective use of the old difficulty that Natural Selection cannot be the cause of the variations from which it selects the fittest to survive, and emphasizes the logical incompleteness of an ultra-Darwinian view which is content to leave the causes of Variation unexplained. He shows further how little support the facts lend to the initial assumption of an indefinite number of multifarious variations in every direction, how manifestly the actually occurring variations which have more than individual extension are correlated with definite changes in the organic conditions of life. Lamarckism, therefore, not only accords with the facts, but also has this important methodological superiority over Darwinism, that it enables us to carry scientific explanation one step further.

But Professor Cope is not satisfied with this. He essays also to determine why, and in virtue of what, living beings adapt themselves to the changes of their environment, and here his views acquire still greater philosophic interest. The process, according to him, is not by any means a mechanical one. It is to be understood only by the intervention of consciousness. A living organism consciously strives to adapt itself to its conditions of life, and it does so because adaptation yields pleasant, and non-adaptation unpleasant, sensations. And it is this conscious effort which gradually builds up the mechanical structure of the body, all of which is ultimately deposited by the living protoplasm. It is, however, slowly and with difficulty that these efforts after adaptation affect the relatively-isolated germ-plasm, and this sufficiently accounts for the comparative rarity and slowness of the transmission of acquired characteristics. The key to the problem of heredity is to be found in analogies not physical but psychical. The germ contains the record of the past history and experience of the race; the registration of that record observes laws whose character is essentially psychological, and Professor Cope finally suggests outright (p. 493) that "if heredity is a form of memory, its laws may resemble those of psychic memory."

It will be seen that Professor Cope is by no means a believer in the automaton theory, which would make consciousness a merely otiose and accidental "epiphenomenon," displayed by organisms which were developed by the survival of a succession of happy accidents. On the contrary, he urges the strongest reasons against any such pandering to materialistic prejudice in the supposed interests of scientific method. He points out that "as no adaptive movement is automatic the first time it is performed, we may regard effort as the immediate source of all movement," and (p. 505) "although it is frequently alleged or assumed that designed conscious acts are the products of reflexes, no one has yet shown how this is possible. On the other hand, the development of automatic acts out of conscious ones is of ordinary occurrence, and is known under the name of education." Thus the unconscious functions of the organism are simply cases of a "retrograde metamorphosis of energy," such as abound everywhere. Professor Cope is quite aware of the full scope of his doctrine, and consistently thinks that "the true definition of life is *energy directed by sensibility, or by a mechanism which has originated under the direction of sensibility*" (p. 513). He holds not only that "life has preceded organization, but that consciousness was coincident with the dawn of life" (p. 508).

And these propositions are not only backed by an amplitude of illustration, but advanced in the light of a full knowledge of the difficulties they are commonly thought to involve. Professor Cope's replies to two of these will be found especially interesting. The first is the difficulty of ascribing consciousness to the lower animals and the plants. This difficulty is greatly lessened if we remember that habitual activity may become automatic and unconscious. It follows that as far as their consciousness is concerned, many of the animals of the present day may be thoroughly degenerate. Their case is analogous to the difference recognized in sociology between modern savages and ancient, whose habits had not become hopelessly crystallized. As for plants, they also are degenerate as a class: they lost consciousness by becoming "earth parasites," a process of which the history may still be traced in the Protozoa, who in youth display the purposive motions of animals, but later on "settle down" and become plants. The vegetable kingdom as a whole, having devoted itself to the manufacture of protoplasm out of inorganic matter, found that this occupation is best carried on in a sedentary posture and with a consequent loss of consciousness. The animal world, on the other hand, discovered that much energy could be economized by becoming parasitic on plants and annexing ready-made protoplasm, and its surplus energy developed a higher consciousness. There is then no insuperable difficulty about the doctrine of "Archaesthetism," *i.e.*, about conceiving consciousness as a primary characteristic of life.

And, secondly, this view is further supported by the unique character of protoplasm and the impossibility of assimilating its action to that of the other physical and chemical forces. It is not true that by constructing 'organic' compounds our chemistry has come any nearer to solving the mystery of life. For though it was a mistake to suppose that only living beings could produce these compounds, yet Professor Cope contends they are all products of organic waste, deposited in the breaking up of protoplasm. It is in growth, *i.e.*, in the production of protoplasm alone, that the characteristically vital changes are exhibited. And as the growth of a living organism is endothermic and essentially involves an *absorption* of energy, Professor Cope protests against its being included by Herbert Spencer in one and the same formula of Evolution with physical processes which involve the *dissipation* of energy. He proposes instead to recognize it as a special form of energy under the name of "bathmism," of which the direction is not, like that of all other forms, towards degradation and dissipation, but towards the integration and absorption of energy. In Professor Cope's language, it is not *catagenetic*, but *anagenetic.*

The philosopher will at first be inclined to regard this theory as merely a revival of the old 'vital force,' and be prepared to find it as sterile as its predecessor. But it differs from it by being an attempt at generalizing a large number of empirical observations, and no merely tautologous and verbal deterrent from further investigation. And Professor Cope ingeniously utilizes it to explain a peculiarity about the history of organisms which has hardly been noticed, and certainly not explained, in the current theories of Evolution. I refer to its *progressive* character, to the predominance of progress over degeneration, of "anagenesis" over "catagenesis." Of this the ordinary Darwinian 'Survival of the Fittest' offers no explanation, for no reason is given why the fit should not generally be the structurally degenerate, as in cases of degeneracy they exceptionally are. Professor Cope recognizes this progressiveness as a fact to be explained, and suggests (p. 448) that "the existence of the peculiar form of energy" showing itself in "the building or growth of the added characters" explains it. It is refreshing to have the existence of the problem recognized, but I cannot see that the mere existence of 'bathmism' solves it any better than Spencer's 'law' of heterogeneity. For just as in the latter case we must still ask why the tendency towards heterogeneity prevails over the contrary tendency towards homogeneity, so here we are not told why 'bathmism' triumphs over the catagenetic forms of energy. In other words, the law of Progress is not yet discovered, though the recognition of the specific peculiarity of vital energy seems a large step in the right direction.

Enough has perhaps been said to convey some idea of the great suggestiveness of Professor Cope's book to all students of the philosophy of Evolution. I regard it as especially valuable for its clear exposition of the ultimate necessity, even in science, of explaining the lower by the higher (the biological by the psychological rather than by the physical and chemical, in this case), and as an important contribution to the proper method of such explanation. And in an age in which the joy of working the methodological assumptions of the lower sciences has too often led to their indiscriminate and exclusive application, one cannot be too grateful to a scientist of Professor Cope's eminence when he, from his side, essays to pave the way for the final harmony of the facts of science with the postulates of philosophy.

F. C. S. SCHILLER.